Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

May 26, 2009
U7-C-STP-NRC-090049

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
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South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Responses to Requests for Additional Information

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) letter number 92 related to Combined License Application (COLA) Part 2, Tier 2, Section 02.03.01, "Regional Climatology;" letter number 103 related to COLA Part 2, Tier 2, Section 4.6.6.1, "Functional Design of Control Rod Drive System;" and letter number 106 related to COLA Part 2, Tier 2, Section 3.5, "Internally Generated Missiles (Inside Containment)." This submittal forms a complete response to RAI letter numbers 92, 103, and 106. Attachments 1 through 4 provide responses to the following RAI questions:

02.03.01-21	02.03.01-22
03.05.01.02-1	04.06-1

When a change to the COLA is indicated, the change will be incorporated into the next routine revision of the COLA following NRC acceptance of the RAI response.

There are no commitments in this letter.

If you have any questions regarding these responses, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

D091
NRO

STI 32475422

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 5/26/09

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

rhb

Attachments:

1. Question 02.03.01-21
2. Question 02.03.01-22
3. Question 03.05.01.02-1
4. Question 04.06-1

cc: w/o attachments and enclosure except*
(paper copy)

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RAI 02.03.01-21

QUESTION:

This question is related to the applicant's response to RAI 02.03.01-4(a). The staff finds the response to RAI 02.03.01-4(a) incomplete.

Revise the FSAR to identify extreme wind site characteristics for the STP site and surrounding area based on the most severe hurricanes that have been historically reported for the STP site and surrounding area.

General Design Criteria (GDC) 2 to Appendix A to 10 CFR Part 50 states, in part, that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as hurricanes without loss of capability to perform their safety functions. GDC 2 further states that the design bases for these structures, systems, and components shall reflect appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. Similarly, 10 CFR 52.79(a)(iii) states, in part, that the COL FSAR shall include the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically report for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and time in which the historical data have been accumulated.

In order to be compliant with GDC 2 and 10 CFR 52.79(a)(iii), the extreme wind site characteristics for the STP site and surrounding area should be based on the most severe hurricanes that have been historically reported for the STP site and surrounding area.

RESPONSE:

FSAR Section 2.3S.1.3.1 will be replaced as shown below to incorporate information regarding extreme wind site characteristics for the STP site and surrounding area based on the most severe hurricanes that have been historically reported for the STP site and surrounding area.

2.3S.1.3.1 Extreme Winds

~~Estimating the wind loading on plant structures for design and operating bases is based upon the "basic" wind speed, which is the "3-second gust speed at 33 feet (10 meters) above the ground in Exposure Category C," as defined in Sections 6.2 and 6.3 of the ASCE-SEI design standard, "Minimum Design Loads for Buildings and Other Structures" (Reference 2.3S-10).~~

~~The basic wind speed is approximately 125 mph (201 km/h), as estimated by linear interpolation from the plot of basic wind speeds in Figure 6-1 of ASCE 2002 (Reference~~

~~2.3S-10) for that portion of the U.S. that includes the site for STP 3 & 4. From a probabilistic standpoint, this value is associated with a mean recurrence interval of 50 years. Section C6.0 (Table C6-3) of the ASCE-SEI design standard provides conversion factors for estimating 3-second gust wind speeds for other recurrence intervals (Reference 2.3S-10). Based on this guidance, the 100-year return period value is determined by multiplying the 50-year return period value by a scaling factor of 1.07, which yields a 100-year return period 3-second-gust wind speed for the site of approximately 134 mph (215 km/h). Three second gust wind speed is always greater than the fastest mile wind speed. In the reference ABWR DCD, the actual extreme of 122 mph is the fastest mile wind speed. This corresponds to a 140 mph 3-second gust, therefore the calculated 100-year fastest mile 3-second gust related to the reference ABWR DCD is not exceeded.~~

~~The reference ABWR DCD Tier 1, Table 5.0 and reference ABWR DCD Tier 2, Table 2.0-1 includes the following site parameter values for Extreme Wind, for which the ABWR plant is designed:~~

- ~~177 km/h (110 mph) equivalent to 126 mph (3-second gust) - Basic Wind Speed, 50-year recurrence interval (for design of nonsafety-related structures only)~~
- ~~197 km/h (122 mph) equivalent to 140 mph (3-second gust) - 100-year recurrence interval (for design of safety-related structures only)~~

~~Therefore, both the site-specific 50-year fastest mile basic wind speed and 100-year recurrence interval fastest mile wind are less than or equal to those specified in the reference ABWR DCD.~~

To ensure that the design bases for SSCs important to safety include appropriate consideration for the most severe natural phenomena historically reported for the site and surrounding area, the design and operating bases wind loadings on plant structures were determined in accordance with ASCE/SEI, design standard, "Minimum Design Loads for Buildings and Other Structures," (Reference 2.3S-10). This is consistent with the guidance provided in NUREG-0800, Section 2.3.1 (Reference 2.3S-6).

Design wind loading is based on a basic wind speed, which is the "3-second gust speed at 33 feet (10 meters) above the ground in Exposure Category C," as defined in Sections 6.2 and 6.3 of Reference 2.3S-10. The basic wind speed for the STP 3 & 4 site is approximately 125 mph (201 km/h), based on a linear interpolation from the plot of basic wind speeds in Figure 6-1 of ASCE/SEI (Reference 2.3S-10) for that portion of the U.S. that includes the site for STP 3 & 4. From a probabilistic standpoint, a basic wind speed of 125 mph (201 km/h) for the STP 3 & 4 site is associated with a mean recurrence interval of 50 years. Section C6.0 (Table C6-3) of the ASCE-SEI design standard provides conversion factors for estimating 3-second gust wind speeds for other recurrence intervals (Reference 2.3S-10). Based on this guidance, the 100-year return period value is determined by multiplying the 50-year return period value by a scaling

factor of 1.07, which yields a 100-year return period 3-second gust wind speed for the site of approximately 134 mph (215 km/h).

Three-second gust wind speed is always greater than the fastest mile wind speed. In the reference ABWR DCD, the listed extreme of 122 mph is the fastest mile wind speed. This corresponds to a 140 mph 3-second gust; therefore, the calculated 100-year fastest mile 3-second gust related to the reference ABWR DCD is not exceeded.

The reference ABWR DCD Tier 1, Table 5.0 and reference ABWR DCD Tier 2, Table 2.0-1 include the following site parameter values for Extreme Wind, for which the ABWR plant is designed:

- 177 km/h (110 mph) equivalent to 126 mph (3-second gust) - Basic Wind Speed, 50-year recurrence interval (for design of nonsafety-related structures only)

- 197 km/h (122 mph) equivalent to 140 mph (3-second gust) - 100-year recurrence interval (for design of safety-related structures only)

Using the data and the methodology recommended in Reference 2.3S-10, both the site-specific 50-year fastest mile basic wind speed and 100-year recurrence interval fastest mile wind for the STP 3 & 4 site are less than or equal to those specified in the reference ABWR.

The NOAA Coastal Services Center (CSC) Hurricane Track Query was also used to review the historical record of tropical cyclone tracks and intensities near the STP 3& 4 site for the period from 1851 to the present. This review identified eleven tropical cyclones with wind speeds that exceed a design basis wind loading for the STP 3 & 4 site calculated in accordance with Reference 2.3S-10. The top five storms include: Not named 1886 (155 mph sustained wind speed); Not named 1900 (144 mph sustained wind speed); Not named 1932 (144 mph sustained wind speed); Not named 1945 (138 mph sustained wind speed); and Hurricane Carla 1961 (144 mph sustained wind speed). The maximum wind speeds are not measured by anemometers for these eleven storms and estimates are from other data. Additionally, CSC Hurricane Track Query is typically not used for the determination of design wind loading for buildings. However, wind speeds identified during this review fall within the envelope for wind speeds addressed in Sections 2.3S.1.3.2, "Tornadoes," and do not represent a threat to the integrity of any STP 3 & 4 SSC.

Using the data and the methodology recommended in Reference 2.3S-10 to verify design basis wind loadings are less than or equal to those specified in the reference ABWR without specific consideration of the CSC Hurricane Track Query data satisfy the requirements of ASCE/SEI (Reference 2.3S-10) and NUREG-0800 (Reference 2.3S-6). The ASCE/SEI design standard wind speed map considered wind speeds of historically reported hurricanes and is updated periodically. Therefore, appropriate consideration has been given to the most severe tropical cyclones historically reported and the

consequences of these storms are bounded by other phenomena considered in the design basis.

RAI 02.03.01-22

QUESTION:

This question is related to the applicant's response to RAI 02.03.01-8(b). The staff finds the response to RAI 02.03.01-8(b) incomplete.

(a) Revise the STP 3 & 4 0% exceedance maximum dry-bulb and concurrent wet bulb ambient design temperature site characteristics to include the higher of either the maximum historic dry bulb value or maximum 100-year return period dry bulb value for Victoria.

(b) Revised (sic) the STP 3 & 4 0% exceedance maximum wet bulb ambient design temperature site characteristic to include the higher of either the maximum historic wet bulb value or 100-year return period wet bulb value for Palacios.

(c) Revise the STP 3 & 4 0% exceedance minimum dry bulb ambient design temperature site characteristics to include the lower of either the minimum historic dry bulb value or minimum 100-year return period dry bulb value for Victoria.

(d) The response to RAI 02.03.01-8(b) states that the maximum (0% exceedance) coincident wet bulb temperature for Palacios (1988-2007) is 77.8 °F. This conflicts with the response to RAI 02.03.02-4 which states the value for this site characteristic is 83 °F.

10 CFR 52.79(a)(1)(iii) states that COL applicants must identify the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. In order to be compliant with § 52.79(a)(1)(iii), the ambient design temperature site characteristics should be based on the higher of either historic or 100-year return period values. Temperatures based on a 100-year return period are considered to provide sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated as required by the regulation.

RESPONSE:

RAI 02.03.01-8(b) requested that STP "Justify not including meteorological data from Palacios in the selection of the 0% exceedance coincident and non-coincident wet bulb temperatures and the 100-year return period maximum wet-bulb temperature ambient design temperature site characteristics as discussed in FSAR Section 2.3S.1.5." The purpose of RAI 02.03.01-8(b) was to resolve an apparent inconsistency in FSAR Section 2.3S.1.5. Specifically, climate data from nearby Palacios Municipal Airport is identified in FSAR Section 2.3S.1.5 as being representative of the STP site and is used as the basis for each of the following:

a) maximum ambient threshold dry-bulb temperatures at annual exceedance probabilities of 2.0%, 1.0%, and 0.4%, along with the mean coincident wet-bulb (MCWB) temperatures at those values;

b) minimum ambient threshold dry-bulb temperatures at annual exceedance probabilities of 99.0 and 99.6%; and

c) maximum ambient threshold wet-bulb temperatures at annual exceedance probabilities of 2.0%, 1.0%, and 0.4% (noncoincident).

However, as noted in RAI 02.03.01-8(b), FSAR Section 2.3S.1.5 uses data from the Victoria, Texas, NWS station, to calculate:

a) 0% exceedance coincident and non-coincident wet bulb temperatures; and,

b) 100-year return period maximum wet-bulb temperature ambient.

FSAR Section 2.3S.1.5 and the response to RAI 02.03.01-8(b) explained that data from Victoria, Texas, NWS station, was used to calculate these particular values because regulatory guidance specified minimum requirements for the amount of historical data necessary to develop the required projections and the minimum required amount of historical data was not available for Palacios Municipal Airport.

The response to RAI 02.03.01-8(b) stated that if the smaller data set from Palacios Municipal Airport is used to determine the 100-year return period maximum wet bulb temperature then the resulting temperature would be 88.3°F, which is slightly higher than the 86.1°F value when based on the Victoria data as currently presented in FSAR Section 2.3S.1.5. This difference was expected because Palacios, which is located on the Gulf of Mexico, experiences lower maximum and higher minimum dry-bulb temperatures but greater maximum wet bulb temperatures (i.e., greater humidity) than Victoria, which is located approximately 45 miles inland.

RAI 02.03.01-22 makes four separate requests. RAI 02.03.01-22 (a) and (c) are requesting that STP revise FSAR Section 2.3S.1.5 to use data from Victoria, Texas, NWS station, for the determination of STP site characteristics related to 0% exceedance and 100-year return for dry-bulb temperatures. RAI 02.03.01-22 (b) is requesting that STP revise FSAR Section 2.3S.1.5 to use data from Palacios Municipal Airport for the determination of STP site characteristics related to 0% exceedance and 100-year return for wet bulb temperature. RAI 02.03.01-22 (d) is requesting resolution of a conflict between temperature data provided in RAI 02.03.01-8(b) and RAI 02.03.02-4.

STP evaluated each of the observations and concerns presented in RAI 02.03.01-8(b) and RAI 02.03.01-22. This evaluation was based on the premise that 10 CFR 52.79(a)(1)(iii) requirements to identify the characteristics of the proposed site are based on the need to identify site characteristics that could affect the safe design and siting of the plant. As explained in NUREG-0800, Standard Review Plan, "ambient temperature and humidity statistics …are

determined for use in establishing heat loads for the design of normal plant heat sink systems, post-accident containment heat removal systems (i.e., ultimate heat sink (UHS) design), and plant heating, ventilating, and air conditioning systems." Meteorological data used for the UHS analysis is addressed in FSAR Sections 2.3S.1.4 and 9.2.5.5 and clarified in the response to RAI 02.03.01-8(a) and is outside the scope of this RAI. Meteorological data in FSAR Section 2.3S.1.5, "Design Basis Dry- and Wet-Bulb Temperatures," is intended only to ensure adequacy of the design inputs for plant heating, ventilating, and air conditioning (HVAC) systems.

As indicated in the first paragraph of FSAR 2.3S.1.5, "Long-term, engineering-related climatological data summaries, prepared by the ASHRAE from observations at the nearby Palacios Municipal Airport (Reference 2.3S-9), are used to characterize design basis dry- and wet-bulb temperature conditions representative of the site for STP 3 & 4." Statements in FSAR Sections 2.3S1.1 and 2.3S.2.1 notwithstanding, STP concluded that temperature data from Palacios is more appropriate than the data from the Victoria, Texas, NWS station, for use as the design basis for STP HVAC systems based on the relative proximity of these locations to both the STP site and to the Gulf of Mexico. STP also concluded that the amount of historical data from Palacios is sufficient for HVAC system design. Therefore, as stated in FSAR 2.3S.1.5, Palacios data is used for 2.0%, 1.0%, and 0.4% annual exceedance probabilities. The 1.0% annual exceedance probability is used as design input for nonsafety-related HVAC systems. The 2.0% and 0.4% annual exceedance probabilities are not used as design input for any portion of the STP 3 & 4 design.

Notwithstanding STP's determination that temperature data from Palacios is both appropriate and sufficient for use as the HVAC design basis, temperature data from Victoria was used for determination of 100-year return intervals to allow use of at least 30 years worth of data for these calculations consistent with industry practice and regulatory guidance. The use of Victoria temperature data for determination of 100-year return intervals is explained in FSAR Section 2.3S.1.5 as follows:

> The data summaries from which the preceding statistical values were obtained [i.e., based on Palacios data] do not include values that represent return intervals of 100 years. Maximum dry-bulb, minimum dry-bulb, and maximum wet-bulb temperatures corresponding to a 100-year return period were derived through linear regression using individual daily maximum and minimum dry-bulb temperatures and maximum daily wet-bulb temperatures recorded over a 30-year period, from 1971 to 2000, at the Victoria, Texas, NWS station (References 2.3S-7 and 2.3S-8). Because the 100-year return period dry-bulb temperature values are extrapolated from a regression curve, no corresponding MCWB temperatures are available for this return interval.
>
> Based on the linear regression analyses of these data sets [i.e., Victoria data] for a 100-year return period, the maximum dry-bulb temperature is estimated to be 111.3°F (44°C), the minimum dry-bulb temperature is estimated to be approximately 3.6°F (-15.8°C), and the maximum wet-bulb temperature is estimated to be 86.1°F (30°C).

As described earlier in this RAI response, use of the data from Victoria is conservative for

estimating the dry-bulb temperature minimums and maximums applicable to the STP 3 & 4 site because the dry-bulb temperature extremes at Victoria are greater than those at Palacios. Additionally, the existing presentation of this data in FSAR Section 2.3S.1.5 (shown above) already satisfies the request in RAI 02.03.01-22 (a) and (c) that the FSAR use data from Victoria, Texas, NWS station, for the determination of STP site characteristics related to 100-year return for dry-bulb temperatures.

The request in RAI 02.03.01-22 (b) to "Revised (sic) the STP 3 & 4 0% exceedance maximum wet-bulb ambient design temperature site characteristic to include the higher of either the maximum historic wet-bulb value or 100-year return period wet-bulb value for Palacios" was also evaluated by STP. As noted in FSAR 2.3S.1.5, "The maximum dry-bulb in combination with coincident wet-bulb provides the annual cooling, dehumidification, and enthalpy design condition, which is used as input to determine the HVAC system cooling loads." Selecting the maximum dry-bulb temperature based on Victoria data and the maximum wet-bulb temperature based on Palacios for determination of HVAC design requirements is not appropriate because HVAC loading is based on "coincident" wet-bulb and dry-bulb conditions. Mixing the maximum values for dry-bulb temperature at one geographic location and point in time with wet-bulb temperatures from a different geographic location and different point in time is not a valid predictor of the actual conditions. This is particularly true when the different geographic locations and times are selected to be the worst case for the particular parameter being considered (i.e., dry-bulb temperatures at Victoria on the hottest day and wet-bulb temperatures at Palacios on the most humid day).

The request in RAI 02.03.01-22 (b) to use "the higher of either the maximum historic wet-bulb value or 100-year return period wet-bulb value" is also inconsistent with specific requirements in ABWR Table 2.0-1, "Envelope of Standard Plant site Design Parameters." ABWR Table 2.0-1 establishes the Design Parameter for Ambient Design Temperature as "0% Exceedance Values (Historical Limit)" and does not establish 100-year return period temperature as a Plant Site Design Parameter. The "0% Exceedance Values (Historical Limit)" is incorporated into the STP COLA in COLA Table 5.0, "ABWR Site Parameters." There is no requirement in the ABWR DCD for the STP COLA to use 100-year return temperatures as the site characteristic. Note that STP provides both the "0% Exceedance Values (Historical Limit)" in STP COLA in COLA Table 5.0 and the "100-year maximum dry-bulb temperature and coincident wet-bulb temperature" in FSAR Section 2.3S.1.5.

Note that STP 3 & 4 FSAR Section 2.3S.1.5, states: "0% maximum noncoincident wet-bulb temperature has been identified as [a] departure[s] to ABWR Tier 1 Table 5, and Tier 2 Table 2.0-1 parameters (see STP DEP T1 5.0-1). As discussed in STP COLA Table 2.0-2, the slight temperature exceedances from the DCD site parameters have no adverse impact on either the HVAC or UHS design for STP 3 & 4."

Based on the above, STP has concluded that the existing presentation of temperature data in FSAR 2.3S.1.5 satisfies requirements in 10 CFR 52.79(a)(1)(iii) to identify the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with

sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated.

In response to the request in RAI 02.03.01-22 (d), STP reviewed the Palacios meteorological data (1988-2007) and determined that the maximum (0% exceedance) coincident wet-bulb temperature for Palacios is 77.8°F as stated in the response to RAI 02.03.01-8(b), instead of 83°F as indicated in the response to RAI 02.03.02-4.

RAI 03.05.01.02-1

QUESTION:

In Subsection 3.5.4.6, "Maintenance Equipment Missile Prevention Inside Containment," of the STP 3/4 COL application FSAR, Revision 2, STPNOC (applicant) commits to establish procedural controls to ensure that unsecured maintenance equipment will be removed from containment prior to operation, moved to a safe location, or restrained to prevent it from becoming a missile. However, STPNOC has not provided a schedule as when these procedural controls will be implemented. Therefore, provide the schedule for when the procedural controls will be implemented. The NRC staff believes that these procedural controls should be in-place prior to fuel load.

RESPONSE:

STPNOC will have procedural controls established, prior to fuel load, as reflected by FSAR Section 13.5.3.3.1, Administrative Procedures (items 2 and 4). The procedures will ensure, as described in DCD Tier 2, Sections 3.5.4.6 and 3.5.1.2.3(3), that maintenance equipment inside containment, such as hoists, will either be removed prior to operation, moved to a location where they are not a potential hazard to safety-related equipment, or seismically restrained to prevent them from becoming a missile.

A sentence is added to FSAR Section 13.5, in response to RAI 04.06-1, to provide added assurance that the procedures that are identified in or required by the COL License Information Items in ABWR DCD, Tier 2, Table 1.9-1, will be incorporated into the plant procedures according to the incorporated supplements, as applicable. That COLA change reflects also the above response, because ABWR DCD, Tier 2, Table 1.9-1, Item 3.14, applies to this RAI.

No additional COLA change is required as a result of this response.

RAI 04.06-1

QUESTION:

In FSAR Section 4.6.6.1, the applicant addresses the COL License Information Item 4.5, of DCD Table 1.9-1, regarding the CRD and FMCRD maintenance procedures' prerequisites in respect to preventing a potential loss of reactor vessel water inventory by prohibiting coincident removal of the CRD blade and drive of the same assembly. The applicant states that "These procedures are in accordance with the guidelines in Section 13.5." However, these procedures are not identified in Section 13.5. Include the CRD and FMCRD maintenance procedures under Subsection 13.5.3.4.2 to assure that the specific procedures will be developed as required by the COL License Information Item 4.5.

RESPONSE:

The incorporation of the COL License Information Item 4.5 into plant maintenance procedures is adequately addressed by the STP 3&4 Quality Assurance Program Description (QAPD) and FSAR Subsection 13.5.3.4.2 item (8) combined with FSAR Tier 2, Table 1.9-1. The following COLA change provides added assurance that the subject of this RAI is incorporated.

A sentence will be added at the end of the first paragraph in FSAR Section 13.5, as shown below:

> The information in this section of the reference ABWR DCD, including all subsections, is incorporated by reference with the following supplements that address COL License Information Items 13.3 through 13.6. The procedures that are identified in or required by the COL License Information Items in ABWR DCD, Tier 2, Table 1.9-1, will be incorporated into the plant procedures according to the following supplements, as applicable.